

What is claimed is:

[Claim 1] A semiconductor device comprises:

a substrate;

a buffer layer comprising AlGaN formed on the substrate, wherein surfaces of the buffer layer are c facets of N atoms;

an electron donor layer comprising AlGaN formed on the buffer layer, wherein surfaces of the electron donor layer are c facets of N atoms;

a channel layer comprising GaN or InGaN formed on the electron donor layer, wherein surfaces of the channel layer are c facets of N atoms;

a source electrode and a drain electrode formed on the channel layer;

a cap layer comprising AlGaN formed between the source electrode and the drain electrode, wherein surfaces of the cap layer are c facets of N atoms and at least a portion of the cap layer is in contact with the channel layer; and

a gate electrode formed at least a portion of which is in contact with the cap layer.

[Claim 2] A semiconductor device according to claim 1, wherein the gate electrode is formed so that at least a portion of which is in contact with the channel layer.

[Claim 3] A semiconductor device according to claim 1, wherein the gate electrode is formed on the cap layer.

[Claim 4] A semiconductor device according to claim 3, wherein the gate electrode has a surface area which is larger than that of the cap layer.

[Claim 5] A semiconductor device according to claim 1, wherein the gate electrode is positioned closer to the source electrode than to the drain electrode.

[Claim 6] A semiconductor device according to claim 1, wherein the gate electrode is positioned in a region where the cap layer is reduced in thickness or removed.

[Claim 7] A semiconductor device according to claim 1, wherein:

the gate electrode is formed on a side of the cap layer closer to the source electrode; and

the cap layer is formed between the gate electrode and the drain electrode.

[Claim 8] A semiconductor device according to claim 1, wherein the cap layer includes a semiconductor layer formed on the electron donor layer and an insulating film formed on the semiconductor layer.